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ence occurred four or five times in the next day or two and I began to regard it as mysterious, never thinking of the birds in such a connection. Some four days later while watching the birds—I was in the room with them—a chat came and alighted on my shoulder and shrill in my ear sounded the exact reproduction of the postman's call. The very direction and distance from which the call came and its exact tone were reproduced. I heard it many times afterward, friends and other members of the family became familiar with the call, and even after I was aware of it, when I was expectant, I have heard the postman, gone to the door and finding no one, knew how realistic was the reproduction of the postman's call by a yellow-breasted chat.

One of a brood of red-winged blackbirds (*A. phœniceus*), a male, crows constantly for all but two months in the year. The crow is an imitation of the crow of the common bantam rooster. Distance and direction are clearly indicated. The sound always appears to come from the rear of the house, at some little distance, and is a very clever imitation of the crow of a bantam rooster. This is the only song this bird has.

A blue jay (*C. cristata*) reproduces the song of the cardinal (*C. cardinalis*) so perfectly as to deceive any one. It is copied from a cardinal in the room, and distance and direction are not indicated.

A European jay (*Garrulus glandarius*) has learned from a cockatoo to say 'How do you do,' 'How do, pretty polly,' 'Pretty polly' and some whistles and calls.

"Last summer on a Wisconsin farm there was a duck hatched out with thirteen turkeys by a hen as a foster-mother. This duck followed the turkeys around and wavered a very long time before it went into the water, and it still imitates the *turkey's note* with its *duck voice*. It sleeps under the turkeys' roost at night now, although it is quite an old duck, and scorns the company of the other ducks on the plantation. This interesting family is on the farm of Mr. Clinton D. Stewart, whose post-office address is Dousman, Wisconsin. Mrs. Merrick first called my attention to the duck's turkey call; but I was not entirely satisfied until I heard it myself." (Extract from letter of Edwin T. Merrick, 836 Gravier street, New Orleans, La., October 19, 1901, to W. E. D. Scott.)

This call of the turkey given by a duck is of special interest as præcocial birds appear to have much less receptivity than altricial birds. The reason seems obvious.

In concluding a word is necessary as to the probable reason why birds in confinement diverge from the normal in the habits of song. Presuming that wild birds are pretty constantly employed in obtaining a food supply, it would seem that they *do not have much leisure*. On the contrary, birds in captivity with all their physical wants carefully looked after, *have leisure* and employ it in giving their attention to occurrences about them, particularly such as are accompanied by any noise.

Of this factor of leisure among animals in confinement little is known, and a broad field is presented for those investigators who have opportunities in zoological gardens or, better still, in special laboratories equipped for this and kindred studies.

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MUSEUM STUDY BY CHICAGO PUBLIC SCHOOLS.

THE Field Columbian Museum is often visited by classes from the Chicago public schools for purposes of instruction obtained by studying the illustrations there afforded of different subjects taught in the schools. The character and value of such

work vary of course with the age and standing of the pupils, and doubtless as well with the individuality of the teacher.

The teachers with whom I have talked are unanimous in saying that the pupils enjoy study at the Museum, not having to be urged to it as to book study, partly, of course, because of the change it affords from the routine of school work, but largely because the objects of study are so tangible and interesting of themselves. Many of the scholars spend considerable time in voluntary study at the Museum outside of school hours. The teachers also say, however, that as might be expected, no immediate results are realized from such work unless the pupils know that some report of their studies will be called for. Such report may be made orally or as a written report on some department of study, or on topics previously assigned. I have sometimes examined such written reports and have found their perusal of considerable interest and value. They furnish as accurate a test as could be devised, probably, of the amount and kind of instruction which pupils are likely to obtain from study of objects in a museum and as well also of that likely to be obtained by those 'children of a larger growth' who visit the Museum with a less definite desire for instruction, but who imbibe it nevertheless. The particular lot of reports now lying on my desk is one of about twenty made by pupils in a class in physiography in the first year in high school, ages say 13 to 15 years. The reports or essays as they might also be called, are descriptive of a visit to the geological department of the Museum for the purpose of finding and noting illustrations of the text-book study of physiography. The pupils were expected to make drawings as well as notes of the objects which they deemed important and such drawings accompany the essays. Some suggestions had previously been given the pupils by the teacher as to topics for study, such as the description of fossils from each of the great geological periods; the study of crystals, meteorites, some special relief maps, etc.

Some points noted in the perusal of the essays may be worthy of comment. The ideas gained by the pupils from the study of the collection of fossils were isolated and fragmentary. Single forms were drawn and described with considerable accuracy, but there seemed to be little conception gained of the march and development of life as a whole, although the collection is sufficiently large and complete to make this manifest. Still, several noted the introduction of fishes in the Devonian age and the excess of vegetation in the Carboniferous. None of the pupils mentioned the animals of larger size, although many skeletons and restorations of these are exhibited. It is curious that while the average visitor of maturer age devotes his attention almost exclusively to these, I have never noticed young people take much interest in them. They take more interest in small objects, such as shells, impressions of ferns, etc. The color of the fossils or matrix was often noted and throughout the essays observation of color is the one thing prominent. The remarks on crystals contained few observations calculated to encourage the modern crystallographer. Almost anything in the mineral collection was regarded as a crystal and the observations made were chiefly on differences of color. From a collection of crystals arranged according to the six systems, one scholar drew the sweeping conclusion that 'isometric crystals are green, yellow-green or cream color; those of the tetragonal system generally red, those of the hexagonal system vermilion,' etc. This was a conclusion from scanty data, but the scoffer may be reminded that the whole world did not do

much better in its study of crystals up to the beginning of the seventeenth century, as witness its reasoning that because quartz was found on the high Alps and sometimes contained water that *ergo* it must be ice frozen so hard it could not melt. A few of the pupils, however, distinguished crystal forms quite accurately and drew excellent representations of them. I believe distinctions of form might be easily taught to pupils of this age and even younger if more attention was paid to it. In nearly all lines of scientific study form is far more important than color.

In their study of meteorites nearly all noticed the 'thumb marks' and gave a reasonable explanation for them. They also noticed the composition of meteorites as made up of iron and stone in different amounts. The finer details of structure were entirely overlooked, however. Only one noticed the Widmanstättian figures, describing them as 'scratches,' and the chondritic structure was not noted at all.

The observations drawn from a study of the relief maps excelled all others in accuracy and fullness.

The region of the Grand Cañon of the Colorado, for instance, was correctly described as a valley worn to a profile of equilibrium into which a subsequent cañon had been cut by the rise of the land. This had doubtless been stated in the text-book, but the relief map evidently gave the subject a vividness and reality. So also from a map showing the extent of the continental glacier, the southern limit of the glacier was correctly traced and a permanent impression, doubtless, of an important fact gained. On other relief maps the positions and relations of plateaus, divides and slopes were correctly noted and single geologic features accurately described. One could not read over the portions of the essays devoted to this subject without being convinced that relief maps are most desirable adjuncts for the teaching of geography.

Some glaciated surfaces were noted by all, but few gave a correct explanation for the markings on them although the origin of the markings was stated in an accompanying label. One thought they were due to running water, another to 'undulations in the ground moraine.' I doubt if the young mind is able to conceive fully of the physical effects of a continental glacier.

Graphite was studied by many of the pupils, their interest in it presumably being aroused by their familiarity with it in lead-pencils. The fact that it was black was the principal point noted, although some listed the localities whence it is obtained. From some inconceivable source one lad drew the information that "graphite is used for egg coal, because it contains a great deal of oil, so that it is used where a fire is needed. Coal dust moulded by pressure forms graphite."

The accounts of petroleum and its uses were generally full and accurate and must have been drawn almost entirely from observations on the collection. Such a knowledge of petroleum could not have been gained by reading a dozen books. Asbestos, salt, gypsum, mica and sulphur were among other substances noted, some account being given of the appearance and uses of each. The statements were partly second-hand and partly original, with no evidence of any particular skill in observation. One girl, for instance, stated she could see no difference in appearance between gypsum and asbestos, though the distinction should have been plain. It was evident that the pupils had not as a whole been trained to careful observation, for many obvious distinctions were overlooked.

On the whole the essays showed the need of museum study rather than important results from it. They painfully evinced the fact that copied labels and statements

of text-books furnished the material out of which they were chiefly made. Doubtless many of the labels were copied, without a glance at the specimen which it accompanied. There was far too little evidence of individual, independent observation. Let it be noted, however, that the essays which contained the most personal observations were the most accurate. It was in the essays most largely made up of copied labels that such strangely conglomerated statements as those I have quoted were to be found. This inculcated slavery to print is to my mind one great weakness of modern instruction in the elementary schools, so far as any hope of the promotion of science is concerned, and it is in museum study that one of the best remedies for it is to be found. In order that independent study may be encouraged it may be questioned whether the museum label should aim to give very extended information. To be sure, the mere copying or reading of the label serves to some extent to fix the information it contains upon the mind, but the knowledge would take firmer hold if this information could be gained by a study of the specimen. I have often noticed visitors of all ages studying an unlabeled collection with the greatest persistency and interest, and then have seen them finish it in a glance after it was labeled. They seemed to feel that they were relieved of any further responsibility in regard to it as soon as they saw the labels. Hence, Goode's well-known aphorism that 'a museum should consist of a collection of instructive labels illustrated by specimens' has its limitations. Uttered to call attention to the need for system and as a protest against the lumber room, it had a profound value, but modern experience will hardly consider it a final ideal. It is possible to so prepare and arrange collections that they will tell their own story without more labels than are needed to serve as hints or indexes. Such collections or exhibits will promote the spirit of observation, study and inquiry, and the more they do this the more will they contribute to the advancement of science.

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THE BOUNDARY LINE BETWEEN TEXAS AND NEW MEXICO.

The boundary line between Texas and New Mexico along the 103d meridian was the chief theme of a talk before the National Geographic Society on November 15 by Dr. Marcus Baker. This boundary, created in 1850, was surveyed and monumented, in part, in 1859 by John H. Clark, and his survey was confirmed by Congress in 1891. Recent official maps place this boundary two or three miles west of the 103d meridian, where the law declares it to be. The paper read before the Society was a summary of the results of an enquiry undertaken to discover and weigh the reasons for this discrepancy.

The original monuments set by a survey to mark a boundary in accordance with law, become, when confirmed, the boundary, even when followed by more accurate surveys which show the original monuments not to be where they were designed to be. The more accurate survey does not alter the boundary. It merely shows how well or ill the original survey was done. Of this line, 310 miles long, 180 miles were traced out and marked by mounds of earth or stone in 1859; the remaining 130 miles have not been surveyed. Of the 180 miles surveyed and marked, 24 are at the south end marked by 3 mounds and 156 at the north end marked by 23 mounds. The longitude of the south end of the line was determined by chaining eastward from El Paso along the 32d parallel 211 miles, the initial station being